PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference FNTYA011WO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/JP2004/002016	International filing date *(day/month/year)* 20.02.2004	Priority date *(day/month/year)* 19.05.2003

International Patent Classification (IPC) or national classification and IPC
H01M8/04, H01M8/06, B60L11/18

Applicant
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1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *sent to the applicant and to the International Bureau)* a total of sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
04.02.2005	10.08.2005

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/002016

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-26	as originally filed
Claims, Numbers	
1-11	as originally filed
Drawings, Sheets	
1/7-7/7	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/002016

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

The following documents, cited in the I.S.R., have been considered as relevant for the examination of the present application. Their numbering will be adhered to for the rest of the procedure.

D1: US-B-6 475 6551 (DAIHATSU MOTOR CO., LTD.) 5 November 2002 (2002-11-05)

D2: PATENT ABSTRACTS OF JAPAN vol. 2002, no. 10, 10 October 2002 (2002-10-10) & JP 2002 184430 A (SHARP CORP.), 28 June 2002 (2002-06-28)

D3: US 2002/025459 A1 (DAIMLERCHRYSLER AG) 28 February 2002 (2002-02-28)

D4: EP-A-0 343 679 (INTERNATIONAL FUEL CELLS CORP.) 29 November 1989 (1989-11-29)

D5: US-A-4 729 932 (UNITED TECHNOLOGIES CORP.) 8 March 1988 (1988-03-08)

D6: US-B-6 391 2681 (KVAERNER PROCESS SYSTEMS, INC.) 21 May 2002 (2002-05-21)

D7: US-A-4 400 253 (COMBUSTION ENGINEERING, INC.) 23 August 1983 (1983-08-23)

I. Novelty

I.1 Document D1 discloses a fuel cell system comprising a fuel cell, a hydrogen supplying source, an oxygen-containing gas supplying source and a water removing means which can be selected from an electromagnetic valve, a pulsation pump and a supersonic generator (See Col. 4, lines 9-23 & 46-61; Fig. 29-32).

Document D2 discloses a solid polymer fuel cell including fuel gas and oxidizing agent gas passages in which a vibrating unit is provided to remove excessive water contents from the electrodes, said vibrating unit comprising a piezoelectric element and a diaphragm.

Document D3 discloses a method of operating a fuel cell system in which the water contained in the moist exhaust air of the fuel cell is removed from the exhaust air stream by means of absoprtion and then released again by subsequent desorption, whereby the released water can be returned fully or

partially to the process (see P. 2, paragraphs [0014]-[0015]; Fig. 1 & 2).
Document D4 discloses a solid polymer fuel cell system which uses passive water management to remove product water from the cells, whereby the product water is carried away from the electrolyte membrane by a porous cell plate component and moved through bubble barrier seals by means of reactant gas pressure in the cathode side of the cells (see Col. 2, lines 25-45; Fig. 1-4).
Document D5 discloses a fuel cell system comprising at least one individual fuel cell, each individual fuel cell comprising a barrier plate bounding one side of the individual fuel cell, an anode chamber, a cathode chamber, a solid polymer electrolyte membrane and a gas/water separator which includes a porous hydrophilic structure associated with the anode chamber and bounding the other side of the individual fuel cell (see Col. 2, lines 7-27; Fig. 4).

None of these documents discloses a fuel cell system having an electrostatic delivery module in at least one of the gas conduits to effectuate electrostatic delivery of water droplets out of said gas conduits, as presently claimed. **As a consequence, the subject-matter of claims 1-11 can be considered as novel over the content of documents D1-D5.**

I.2 Documents D6 and D7 disclose electrostatic separation processes to remove emulsified water from oil (see Col. 2, line 58 - Col. 3, line 25 & Fig. 1-2 in D6; Col. 2, lines 27-57 & Fig. 1 in D7).
The subject-matter of present application differs from the separation systems disclosed in D6 or D7 in that the electrostatic delivery module used according to present application is composed of multiple electrodes that are arranged in at least one of the gas conduits of a fuel cell system. **Hence, the novelty of presently claimed matter according to claims 1-11 can be acknowledged with respect to D6 and D7.**

I.3 As a conclusion, present claims 1-11 meet the requirements of Art. 33(2) PCT.

II. Inventive step

Document D1, which can be considered as the closest prior art, discloses a fuel cell system comprising a fuel cell, a hydrogen supplying source, an oxygen-containing gas supplying source and a water removing means which can be

selected from an electromagnetic valve, a pulsation pump and a supersonic generator.

The problem to be solved by the present invention may be regarded as providing a fuel cell system that effectively removes the water content from the gas conduit by a simple structure.

The solution to the above named problem, provided by the present invention, consists in developing a fuel cell system having an electrostatic delivery module in at least one of the gas conduits to effectuate electrostatic delivery of water droplets out of said gas conduits.

As none of the prior art documents cited herein suggest the solution proposed by the present application, **presently claimed matter according to claims 1-11 can be considered as inventive** and said claims meet therefore the requirements of Art. 33(3) PCT.

III. Formal defects

1. Documents D1 & D3-D5 should be cited and briefly discussed in the description (Rule 5.1(a)(ii) PCT).